the application to meteorology of the theory of correlation. The two stations taken were Wilmington (North Carolina) and Halifax (Nova Scotia), distant from one another about 1000 miles. Allowing different intervals between the corresponding barometric observations, the magnitude of the correlation was found to vary with these intervals, being greatest when Halifax is taken one day later than Wilmington. It was suggested that for selected places further apart the discovery of correlations of sufficient magnitude might be of use in the practical work of prediction.

Major B. Baden-Powell described briefly the development of the aëroplane, and gave an account of the experiments that he has been recently carrying on. Chief among these were his gliding experiments made at the Crystal Palace, in which he is seeking to find out how a man-carrying machine behaves while travelling in the air.

After a paper by Prof. D'Arcy W. Thompson on Plato's theory of the planets, the business of the subsection came to a conclusion, the following papers being taken as read :—Report of Committee on Underground Temperatures; Dr. F. Hirtel, Zur Flugfrage; Rev. J. M. Bacon, upper air currents and their relation to the audibility of sound; Prof. Lemström (Helsingfors), on the effect of electric air-currents; J. Hopkinson, the rainfall of the midland and eastern counties of England, and the rainfall of England, 1861–1900.

WILLIAM J. S. LOCKYER.

ZOOLOGY AT THE BRITISH ASSOCIATION.

THE meetings of Section D were held in the new Sedgwick Museum of Geology. On Thursday morning, August 18, Mr. W. Bateson, F.R.S., delivered to a large audience his presidential address (see NATURE, August 25), the vote of thanks for which was moved by Prof. Poulton and seconded by Prof. Max Weber. In the afternoon Prof. F. W. Keeble gave an address, illustrated with diagrams and lantern slides, on the coloration of marine Crustacea, embodying results of the researches carried on by Dr. Gamble and himself during the last seven years. He described the prawn-like *Hippolyte varians* which lives among the seaweeds around our coasts, and matches their colour with marvellous precision. Its colours range through green, yellow, and brown to red. When given a choice between different coloured weeds, this animal invariably picks out for its abiding place that weed which is in harmony with its own coloration, a faculty to be ascribed not to the possession of a colour sense by the animal, but rather to an extreme sensitiveness to light. Only in one position, namely, on weed of its own colour, is it in a position of light equilibrium, and then it rests. The coloration of the animal is produced by the manipulation of its three colour pigments, red, yellow, and blue. The common shrimp and prawn were shown to possess the same mechanism, although they make little use of it. Transparent young Hippolytes placed on weed of a certain colour develop the pigment necessary to approximate the animals to that colour in forty-eight hours or less; older animals take almost a week for the same process, and adults a fortnight, but even then the result is imperfect. Though the adults have lost, to a large extent, this power of sympathetic colour change, the pigments react rapidly to changes of light. This reaction is most marked not when the intensity of light changes, but when the background on which the animal rests is changed from white to black, *i.e.* from one which scatters to one which absorbs light. In the daytime the pigments are expanded; at night they are contracted, except the blue, so that the animal has then a transparent azure colour. This is a true periodic change; it has become a habit, and endures for days even though the animals be kept in darkness.

Prof. W. B. Scott, of Princeton, U.S.A., then delivered an address (with lantern illustrations) on the Miocene ungulates of Patagonia The animals described were collected by the Princeton Expedition from the Santa Cruz beds, the Miocene age of which seems to be now established. Prof. Scott pointed out that while these South American ungulates are singularly different (especially in the structure of the periotic region) from those of the northern hemisphere, it is not unlikely that they have a common origin, as Ameghino has described a number of genera from pre-Patagonian formations which, though incompletely known, appear to be referable to the Condylarthra—the parent stock of the northern ungulates. Very probably an early Eocene or late Mesozoic migration carried the Condylarthra into South America, and there, in almost complete isolation, they gradually gave rise to the various peculiar orders of the Noto-Ungulata. The possibility of such a migration is shown by the discovery of an armadillo in the Middle Eocene of North America.

The section was occupied practically the whole of Friday, August 10, with papers and discussions on heredity, Prof. Hickson, F.R.S., in the chair.

The first paper was by Miss E. R. Saunders on heredity in stocks. She said that since the re-discovery of Mendel's work, experimental evidence of the purity of the germ cells has been found in a rapidly increasing number of examples. Much of this evidence has been derived from cases like those studied by Mendel where the differentiating characters are related to each other as dominant and recessive. In such cases the individuals of the (F_1) first generation (DR) show the dominant character, and those of the second (F_2) generation the two parental characters in the ratios 3 D : 1 R or 1 D : 1 R, according as they result from DR×DR or DR×R. In other cases the results are complicated by reversion, gametic coupling of distinct characters, &c., and they require careful analysis, and several generations may be required to elucidate them. As a surface character hoariness is dominant, glabrousness recessive. Experiments in the form DR×DR or DR×R, where D is the white-flowered form of *Matthiola incana* and R a glabrous ten-week strain, give normal Mendelian ratios in F_2. In other cases the result, as regards hoariness and glabrousness, is more complex, owing to the different behaviour of various glabrous strains, which, as far as can be seen, differ only in *flower colour*. As to flower colour, various combinations of colours give reversionary purple in the first generation (F_1). Purple F_1 may also be produced by two white parents if they belong to strains differentiated by the leaf surface. Such purple cross-breeds may give a simple Mendelian result in F_2, or a variety of new colour forms may appear, this latter being commonly seen when cream is one of the parental colours. For example, in a cross of a glabrous white with a glabrous cream, at least nine colour forms were produced in F_2. Whether the appearance of these new forms indicates disintegration or simply re-combination of preexisting characters is uncertain. Creams breed pure at once. Some whites are pure, others are heterozygotes with cream. The number of extracted recessive types resulting from a given union and their specific behaviours are not yet known.

Mr. A. D. Darbishire gave some account of his experiments on the breeding of mice. The Japanese waltzing mice show the well known restless and spinning movements; they have a piebald yellow and white coat and pink eyes. When an albino is crossed with a Japanese waltzing mouse the majority of the offspring are on first inspection indistinguishable from the common house mouse, and they invariably (in all the 300 cases bred) have black eyes. Hybrids never exhibit waltzing movements, and they are never albinos. When such hybrids are bred together they produce offspring which, considered from the point of view of colour, fall into three categories :—(1) those (half the number) with black eyes and coloured coat, and therefore resembling their parents; (2) those (one-fourth) with pink eyes and coloured coat, therefore presenting the same features of eye- and coat-colour as Japanese waltzers; (3) those (one-fourth) with pink eye and uncoloured coat, *i.e.* albinos. About one-quarter of these hybrids waltz, but the rest are normal in their progression, and the waltzing habit may be associated with any of the three colour categories. The albinos (group three) breed true, the pink-eyed mice with coloured coats breed nearly true, and the black-eyed mice with coloured coats produce, when paired together, albinos, pink-eyed mice with coloured coats, and black-eyed mice with coloured coats (proportions of each not yet determined). Some of the facts seem to confirm the Mendelian interpretation, while others may be described in terms of either Galton's or Pearson's formulæ of ancestral inheritance.

Mr. C. C. Hurst described some experiments on heredity in rabbits. An inbred pair of albino Angoras was crossed

reciprocally with an inbred pair of Belgian hares (F_1), and the hybrid progeny were bred with one another for two generations (F_2 and F_3). In F_1 the Angora coat was always recessive to the normal coat, and the albino character recessive to the normal character, while in F_2 and F_3 both these features followed the ordinary Mendelian rules. As to coat colour, in F_1 the first cross of brown and albino gave offspring all of which had wild grey coats. In F_2 the hybrid greys bred together gave a ratio of 9 grey : 3 black : 4 albino, which, when worked out in detail, is in accordance with the Mendelian expectation. Experiments on F_3 proved that the black factor was not introduced by the original brown parent, but by the albino, which, though gametically pure as regards simple albinism, was at the same time carrying the distinct factor for black coat colour.

Prof. Weldon, in opening the discussion, referred to one of Mendel's experiments in which he took a pea of a race producing only seeds with green cotyledons and crossed it with one of another race producing only seeds with yellow cotyledons. The resulting seeds produced plants a quarter of which bore green seeds only, a quarter yellow seeds only, and each of these sets was said to breed true. The remaining half produced seeds with the hybrid properties of their immediate cross-bred parents. Considering how reversion has been found by Mr. Galton in other cases, we might regard the hybrids which made up half the segregation generation as reverting directly to their parents, and the remaining half as reverting to the various green-seeded or yellow-seeded ancestors in various proportions, so that every generation of ancestry was represented to a greater or less extent, the nearer ancestors more frequently, the remoter more rarely. In Mr. Bateson's translation Mendel says that the yellow-seeded individuals reproduce the character of the yellow-seeded "parent form," but we do not know whether Mendel meant the race or one individual of the race. Mr. Bateson and others have adopted the view that, so far as colour is concerned, the green-seeded and the apparently true-breeding yellow-seeded forms were not merely like, but identical with the pure individuals of the green- or yellow-seeded races used in making the original cross. The view attributed to Mendel paid attention to the last two only of the pure-bred ancestors, while that of Galton and others considered that all the ancestors contributed in various proportions to the characters of the subsequent generations. The description of the seed colours is not accurate enough to enable one to decide between these two hypotheses. Because each human being, his parents and grandparents, have seven cervical vertebræ, we have no right to say that we are exactly like our fathers, and that our grandfathers have no share in determining our characters. Again, each of the species included as *Lychnis dioica* has a hairy and glabrous form, the plants resulting from a cross of which are hairy, and the offspring of such hybrids are hairy or glabrous in Mendelian proportions. But we are not told how hairy either plant is. Prof. Weldon counted the hairs on pure-bred hairy plants, and found them to vary from about a dozen to 1300 per sq. cm. of leaf surface. Now if one with 1300 hairs per sq. cm. were crossed with a glabrous plant, and if the offspring had on an average 500 hairs per sq. cm., were they "hairy" like their hairy parent or completely intermediate between the two parents? Questions of this kind required finer methods of observation and description. Again, the frequent existence of reversions to the characters of fairly remote ancestors was inconsistent with the idea that the characters of hybrids might be regarded as due to the combination of "pure" determinants derived from their immediate parents. It had been said that the numerical conclusions drawn from the Mendelian hypothesis agreed so closely with the observed distribution of the descendants of hybrid individuals that these alone justified the conception of gametic purity. It was easy with a small series of results to devise several hypotheses which would fit the results. For example, crossing albino and yellow mice of known ancestry, Cuénot obtained 81 albino, 34 yellow, 20 black, and 16 grey mice, and the remarkable modification of Mendel's theory which he had put forward to describe this result led him to predict the numbers 76, 38, 19, and 19. This was not so good as Prof. Pearson's prediction—82·5, 31, 20·5, 17. In conclusion, he argued that until further experiments and more careful descriptions of results were available, it was better to use the purely descriptive statements of Galton and Pearson than to invoke the cumbrous and undemonstrable gametic mechanism on which Mendel's hypothesis rested.

In the afternoon of August 19 Mr. Punnett, on behalf of Mr. Bateson, described the effects of crossing in fowls, and Prof. Minot added some observations on his experiments upon guinea-pigs.

Mr. Bateson then replied in some detail to Prof. Weldon's criticisms, and maintained that by the Mendelian hypothesis alone was it possible to draw together the vast number of observed facts which had seemed utterly incoherent. The Ancestrians, however, asserted that the laws based on ancestry could cope with the same facts. Prof. Weldon had passed very lightly over the critical fact which finally settled the question—the purity of the characters of the segregated types. None of the various schemes of the Ancestrians had contemplated such purity, and all were totally unable to deal with it. The last attempt to explain away the fact of purity of type was that enunciated to-day by Prof. Weldon, who regarded it as "reversion." But if the "reversion" were so complete as to include even the purity of the parental type, such reversion was Mendelian segregation by another name. The second fact with which the Ancestrians could not deal was the condition of those hybrids or heterozygotes which, though again and again crossed back with pure types, had always the same gametic constitution undiluted. He illustrated this from the work of Mr. R. H. Lock on maize, in which it was shown that, using mongrel materials, as regards yellow and white grains, the inheritance was of a normal Mendelian order. Sweet peas provided further illustrations of the applicability of Mendelian principles to complex cases. It was shown that, in one example, at least eight kinds of purple individuals occur in the second generation, each having distinct powers of transmission, though outwardly indistinguishable. Only minute experiment could distinguish these fundamental differences, which the biometrical system entirely disregarded. The evidence also included one significant case in which sterility of the anthers behaved as a Mendelian character, and made it possible to discriminate two types of extracted whites almost certainly dissimilar in their powers of transmitting colour-factors. Prof. Weldon had asked whether the extracted types showed parental characters unchanged. Frequently the extracted types were identical with the pure, but the question must be answered case by case, according to the special sort of segregation which took place in each case. The Mendelian theory had begun to coordinate the facts of heredity, until then utterly incoherent and contradictory. The advance made in five years had been enormous, and he had no doubt of the result.

Prof. Karl Pearson said that the great revolution which Mr. Francis Galton introduced into biological study was purely a difference of method. The introduction of methods of precision had nothing to do with Mendelism or ancestral law. He had seen the Mendelians produce figures without making any attempt to show that the figures were consonant with the theory they were supposed to illustrate. He believed he had elaborated the most complete Mendelian system ever yet worked out, but this led to general principles which were singularly like those proposed by Galton from observation. He asked from the Mendelians some definite theory which could be worked out, and for further work, for the controversy could only be settled by investigation, not by disputation.

After some remarks by Prof. Hubrecht and Rev. T. R. R. Stebbing, who said that interest in this important inquiry was greatly quickened by the controversy, and hoped it would continue, as from it the world could only gain the light, Prof. Hickson (from the chair) closed the discussion by saying that the subject in dispute was of the greatest importance, and the debate had been of much value to those biologists who were still "sitting on the fence."

In the zoological laboratory there were numerous exhibits of the specimens used in these various experiments on heredity.

At the invitation of His Grace the Duke of Bedford, a party of twenty-five zoologists visited Woburn Abbey on Saturday morning, August 20. The party was met by two representatives of the Duke of Bedford, and driven over the estate to see the splendid collection of animals there maintained in such excellent condition. Numerous species of

deer, the nilgai, gnu, eland, buffaloes and European bison, giraffes, and a fine series of Prjevalsky's horse were greatly admired. Mr. R. Lydekker (the leader of the party) and Prof. Ewart pointed out the interesting features of the rarer forms. The party was afterwards entertained to lunch, and conducted through the picture galleries of the abbey.

On Monday morning, August 22, Dr. C. W. Andrews gave an address on Egyptian Eocene vertebrates and their relationships, particularly with regard to the geographical distribution of allied forms.

Prof. Keibel, of Freiburg, exhibited some "Normentafeln" of the development of Vertebrata, and also some original drawings of embryos of apes. He stated that although there is a close resemblance between these and human embryos in a similar stage (as Selenka has shown), there are found on further examination various differences —apart from the tail—not only between human and Simian embryos, but also between those of different species of apes, so that the species may be determined without difficulty in embryos from the fourth to the fifth weeks.

Then followed communications by Mr. A. E. Shipley, F.R.S. (on behalf of Dr. Elliot Smith), on Looss's researches on *Ankylostoma duodenale* (miner's worm); by Prof. G. N. Calkins on *Cytoryctes variolae*, Guarnieri, the organism of small-pox; and by Dr. J. A. Murray on the biological significance of certain aspects of the general pathology of cancer (for abstracts see NATURE, September 22, p. 519).

Dr. T. H. Bryce demonstrated a series of slides illustrating the histogenesis of the blood of the larva of Lepidosiren.

Mr. J. W. Jenkinson gave an account of the origin of the cleavage centrosomes in the egg of Axolotl. The middle piece of the spermatozoon, after forming the centre of the sperm-sphere and sperm-aster, completely disappears. At a later stage a centrosome is formed from the sperm-nucleus, and this divides to give rise to the cleavage centrosomes. A watery substance collects in vacuoles in the centre of the sperm-sphere, which suggests that the sperm introduces into the ovum a hygroscopic substance.

Four papers from the Irish Fisheries Laboratory were then read by Mr. Tattersall.

Messrs. E. W. L. Holt and W. M. Tattersall described some new and rare Schizopoda from the Atlantic slope on the west of Ireland, Mr. Tattersall some Isopoda, and Mr. G. P. Farran some Copepoda from the same region. Many of the Isopoda and Copepoda collected appear to be identical with, or closely allied to, Norwegian forms. Mr. Tattersall also gave a brief account of a new species of Dolichoglossus. It was found in Ballmakill Harbour, co. Galway, in coarse sand and mud at extreme low water spring tides, eight to twelve inches below the surface, in tubes of sand cemented by mucus. A nearly complete specimen measured 12·5 cm. Its chief points of interest are two proboscis pores, complete and continuous lumen of stomochord, and the great size of the pericardium.

The proceedings on Tuesday morning, August 23, were opened by Prof. Graham Kerr's account of the work of the late Mr. J. S. Budgett on the development of Polypterus. A series of lantern slides, most of which had been prepared from Mr. Budgett's drawings, showed that as regards external characters the development was very like that of an amphibian. There is a pair of true external gills and a pair of cement organs. Dr. Harmer and Prof. Bashford Dean spoke in appreciative terms of Mr. Budgett's work.

Mr. E. J. Bles contributed some notes on the development of *Phyllomedusa hypochondrialis*, Cope. The material described was obtained by Mr. Budgett in South America. Just before hatching paired cement organs are present as vestigial structures, but soon disappear without having become functional. This indicates that Phyllomedusa is probably descended from a form which, like our European Hyla, was hatched as a heavily yolked larva which hung from its cement organ until the yolk was absorbed. The amount of yolk in the egg of Phyllomedusa (which is now large) has probably only comparatively recently increased. There is also a glandular frontal organ in Phyllomedusa probably of use in assisting the embryo to escape from the egg-membranes. The thyroid gland in Phyllomedusa differs from that of other tadpoles, and is more like the early thyroid of Ammocœtes, as it reaches along the whole length of the floor of the buccal cavity. The subnotochordal rod is also conspicuous. The pectoral lymph-hearts in this, as in other tadpoles, appear not at the metamorphosis, but when the tadpole has still a solid intestine and the yolk has almost disappeared from all the other tissues. The wall of the lymph-heart appears to be derived from an outgrowth of the posterior cardinal vein, and before the valves are formed the lumen of the lymph-heart contains blood corpuscles.

Prof. C. S. Minot then communicated three papers. In the first he presented the theory of cellular rejuvenation, which he claimed must be defined as the increase of the nuclear substance in proportion to the amount of the protoplasm. This increase occurs during the period of segmentation of the ovum, is the immediate result of impregnation, and results in the production of rejuvenated cells, *i.e.* cells with a very small amount of protoplasm around their nuclei. These cells and their descendants then enter upon a career of cellular senescence. In an experiment with telegony Prof. Minot used females of a known race the virgin does of which were allowed to breed with a male of entirely different strain, about half the offspring having the paternal colour. The same does were afterwards allowed to breed with bucks of their own race, and in no case was there any trace of the colour of the telegonous father in the offspring. Prof. Minot gave an account of the Harvard embryological collection, which comprises more than 800 series of sections of vertebrate embryos, and pointed out its value in aiding research.

Dr. G. H. F. Nuttall, F.R.S., gave a paper on the precipitin tests in the study of animal relationships. He briefly described the methods of testing by means of precipitating antisera, and pointed out two practical applications of the test—in legal medicine for the identification of blood stains, and in the study of animal relationships. For example, this method has demonstrated a close relationship between Hominidæ and Simiidæ, a more distant one between these and Cercopithecidæ, a slight bond connecting all of these with the New World monkeys. The lemurs do not appear to be connected with the Primates any more than do other mammals. The test appears to connect the Cetacea with the Ungulata, and the Reptilia with the Aves.

In reply to a question by Prof. Poulton, Dr. Nuttall stated that tests of the blood of Echidna do not indicate any relationship between this animal and other mammals.

Prof. E. B. Poulton, F.R.S., gave a paper on the mimetic resemblance of Diptera to Hymenoptera, to which Lord Avebury, Mr. Bateson, and Mr. O. Latter added further observations.

In the afternoon of August 23 three addresses dealing with the evolution of the horse were delivered by Profs. Osborn, Ewart, and Ridgeway (for abstracts see NATURE, September 22, p. 520).

On Wednesday morning, August 24, Mr. J. W. Jenkinson gave an account of the effects produced by growing frog-embryos in salt and other solutions. The object of the experiments was to discover whether the distortion of development produced by growing the eggs of the frog in a 0·625 per cent. solution of sodium chloride is due to the physical (increased osmotic pressure) or chemical properties of the solution or both. The monstrosity consists of (1) failure of the blastopore to close, so that a large persistent yolk-plug is produced, and (2) the failure, total or partial, of the medullary folds to close. Solutions of chlorides or bromides of barium, calcium, &c., cause death of the egg at an early stage, possibly due to the formation of insoluble carbonates in the cells. When kept in chlorides or bromides of potassium, lithium, &c., the egg loses its power of elongating in the direction of the long axis of the embryo, but differentiation of the germ-layers and organs proceeds; ultimately degeneration and disintegration of the tissues set in. In sodium or magnesium chlorides or nitrates the embryo is able to elongate, but development is abnormal. In solutions of urea or sodium sulphate development is nearly or quite normal, especially in the latter solution, in which the tadpoles will live for weeks. Mr. Jenkinson thinks the various phenomena are to be attributed to the poisonous properties of the substances employed.

Prof. M. M. Hartog showed lantern slides of magnetic models of cellular fields of force. He remarked that there is in the dividing cell a dumb-bell-shaped structure recalling the figure of the "field of force" manifested by sprinkling

a sheet of paper, overlying two poles of a magnet, with magnetic dust. He showed photographs of various "fields" obtained by a combination of electromagnets, and pointed out that all the cellular phenomena could be reproduced by the action of a polar or dual force such as statical electricity or magnetism, and that the apparent anomalies were due to the peculiar conditions of the protoplasm in which the field was formed. He also showed some beautiful sections of the embryos of Rhynchelmis, lent by Prof. Vejdowsky, of Prague, in which the dumb-bell-shaped figure is of exceptional size.

GEOGRAPHY AT THE BRITISH ASSOCIATION.

AS the exploration of the higher mountain areas has been mainly the work of university men, it was very appropriate that Mr. Douglas Freshfield, one of the pioneers of Alpine exploration, should be president of the geographical section at Cambridge. No one was better qualified than he to deal with mountains and mankind, which formed the subject of his address, which has already appeared in NATURE (September 1).

Several other communications dealt with the "culminating area" of the globe, as Hermann Wagner calls it. Mr. Maurice de Déchy contributed a full account of the glaciers of the Caucasus, which at one time were supposed to be of very small dimensions. He gave statistics of the altitude of the snow-level in different parts of the system, showing how it rose towards the Caspian, and of the dimensions of the principal glaciers, including the depth to which their tongues descended below the snow-level. He then surveyed the variations of ice movements during the past half century, and pointed out how they corresponded with those which have been observed in the Alps. Finally, he referred to the evidences of the former great extension of the glaciers. Mr. Charles Rabot, secretary of the Paris Geographical Society and of the French Glacial Commission, discussed the importance of glacier-bursts in shaping the topography of glaciated areas. These bursts are due to the creation and subsequent sudden discharge of a reservoir of water, by a glacier dam due to the ice stopping the exit from a valley and the consequent accumulation of water, or to water gathering above, below, or in the glacier itself. The violence of the outburst is proportional to the volume of the water and the slope of the ground. In 1878 the Märjelensee discharged 7,700,000 cubic metres in nine hours, and the Gietroz outburst of 1818 attained a volume of 530,000,000 cubic feet. Twenty-five such outbursts are known to have taken place in the Alps, and they have been reported from all glaciated mountain areas. Their effects are necessarily confined to modifying the contours of the valley, by enormous erosion above, and by the deposition of vast masses of waste below. In discussing glacial phenomena, sufficient importance has probably not been given to these torrential outbursts, which must have been commoner in Pleistocene times. Mr. A. W. Andrews showed a number of excellent maps and views of passes of the Alps in order to prove that in teaching a well chosen set of lantern slides could be used to bring out their characteristic natural features, and to indicate their relation to routes, &c.

There was no tale of startling adventure recounted, but a number of excellent travel papers was read. Mr. Bruce's account of the Scottish National Antarctic Expedition, while barren in hair-breadth escapes, was one of steady scientific investigation under very difficult conditions in perhaps the most interesting area of the Antarctic. Notable though the discovery of the northern Atlantic margin of Antarctica and the depths of the ocean to the north are, the oceanographic, biological, and more particularly the meteorological work of the expedition are likely to yield results of the greatest value. It is a matter of congratulation that Mr. Mossman, probably one of the best living meteorological observers, remains in the south with the cooperation of the Argentine Government, for there the study of meteorological conditions is more important than elsewhere in high southern latitudes in view of the dangers attending the rounding of Cape Horn, and the importance of an investigation of the centres of atmospheric activity controlling its meteorology.

The papers dealing with distant lands described the low-lying Malabar coasts, the savana lands of northern Nigeria, the fertile Cyrenaica, and the puna of the Andine plateau. Mr. R. S. Lepper gave a comprehensive account of the climate, products, and peoples of the Malabar coast, illustrated by excellent views. He pointed out the great progress which had been made during the past half century, and insisted on the economic value of the region. Major J. A. Burdon, Resident of the Sokoto Province, described the Fulani Emirates of northern Nigeria in a communication which it would be difficult to over-rate. The impressive contrasts between the conditions in this laterite plateau dissected by broad flat valleys, leaving monotonous table-topped hills covered with open brush, and the dense forests of southern Nigeria were admirably shown, and the resulting effects traced—Paganism and degenerate peoples in the forest belt, Islam and a well developed social organisation in the north. The effects of the nomad Fulani conquest of the region were traced, and form an interesting contribution of the evidence which goes to prove that a definite type of social organisation is connected with nomadic pastoral peoples all the world over, and that a fairly constant series of events follows the thorough conquest of a settled people by such nomadic tribes. The present British administration is fortunately inspired by the scientific spirit of constructive action based on existing institutions.

In 1903 Mr. Arthur Hill made a journey to Lake Titicaca. The uniformity of the vegetation at altitudes from 12,500 to 16,500 feet was striking; the plants growing in rosettes have long tap-roots by which they reach the warmer soil at some distance below the surface, and their leaves are linear and hairy, and suited to the dry air subjected to temperature variations of as much as 70° F. within a few hours.

Mr. D. G. Hogarth spent nearly a week in Cyrenaica in April, 1904, and was able to note certain geographical facts which explain some of the peculiarities of Cyrenaic history. He pointed out that changes of coastal level must have taken place since ancient times. This point is of considerable importance, as Mr. R. S. Günther showed by a series of maps and photographs of the Neapolitan region. In a paper descriptive of these he summarised the results of his investigations on the Bay of Naples,[1] where he found a mediæval land level 12 to 23 feet below the present one, and a Græco-Roman land level some 16 feet above the existing level, and therefore in places 40 feet above the mediæval one. Round Genoa the coasts were also lower in the thirteenth and fourteenth centuries, and the Nile delta has been shown to be higher in classical times. The old shore lines are not horizontal, and Mr. Günther considers that land oscillations have been the cause of the changes of level. In the discussion which followed Messrs. R. D. Oldham and J. Y. Buchanan both pointed out other changes which had been observed in the level of the Mediterranean. A special committee to investigate the evidence was appointed by the general committee. The two afternoon lectures arranged by this section had reference to the Mediterranean basin; and Dr. Tempest Anderson's views and description of the Lipari Islands reminded his hearers of the obvious unstable condition of part of it at the present day. Mr. Silva White's admirable account of the Nile Valley emphasised its organic unity, its physical and political insularity, which has resulted in the political control of Egypt since the time of Alexander the Great by the Power possessing command of the sea. He also showed some views, and gave an eloquent description of the desert barrier which surrounds it.

Coming to our own country, the papers dealt with problems within the sphere of influence of Cambridge. Mr. H. Yule Oldham, reader in geography at Cambridge, discussed the changes in the fen district since the seventeenth century, when the tides came up the Ouse and nearly reached Cambridge. By the cutting of the new Bedford River and the building of the sluice at Denver, the tidal waters were diverted up the new river, and this permitted the drainage of the fens. The old course of the Ouse was indicated in modern maps by the irregular boundary between Cambridgeshire and Norfolk, which followed it. Mr. R. H. Yapp dealt with the vegetation of the fen region, and by a series of excellent slides showed the characteristic forms found in different edaphic conditions. The Rev. Alfred Hunt claimed the hamlet of

[1] The full report is published in the *Geographical Journal* for August and September, 1903; and in *Archaeologia*, lviii.